Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

No.32 never published. - Information from
Bureau of agricultural chemistry and
engineering, Dec.1940.

1.932
A2Ag8
no.33

LIBRARY
RECEIVED
★ APR 3 1940 ★
U.S. Department of Agriculture

ACE- 33

DESCRIPTION OF REGIONAL RESEARCH LABORATORIES

By R. L. Hanson

E1140-

U. S. Department of Agriculture
Bureau of Agricultural Chemistry and Engineering

Four Regional Research Laboratories are being built by the United States Department of Agriculture. They will be known as the Northern, Eastern, Southern, and Western Regional Research Laboratories, located at Peoria, Illinois; Wyndmoor (Philadelphia), Pennsylvania; New Orleans, Louisiana; and Albany, California, respectively. The program of research for these laboratories is directed toward the discovery and development of new and wider uses, and extended markets, for agricultural commodities and their products and byproducts, especially those that are subject to surplus conditions.

BUILDINGS

The Regional Research Laboratories are all essentially U-shaped structures of three stories and basement, divided into an Administrative Unit forming the base of the U, a Chemical Laboratory Wing carrying research laboratories, and an Industrial Laboratory (Pilot Plant) Wing primarily for semi-plant scale process development. (See figure 1.) There is an attic and penthouse over the Chemical Laboratory Wing and Administrative Unit and that part of the Industrial Laboratory Wing devoted to laboratories.

The buildings are of reinforced concrete-frame construction except for the part of the Industrial Laboratory Wing devoted to process development, which is framed of structural steel. The floor slabs are of the flat arch type, poured with smooth forms, making furred or plastered ceilings unnecessary.

The air-conditioned laboratories are provided with double sash, the outer sash being of steel (projected type) and the inner sash of wood (single sash with storm sash hangings). At all laboratories the outer sash are glazed with heat-absorbing glass on the sun exposures. The windows in the Industrial Laboratory Wing will be glazed with 1/8-inch ribbed glass. A maximum of windows will be provided in the Chemical Laboratory Wing. (See figure 2.)

There will be ample space for parking automobiles on the grounds.

Administrative Unit.--This Unit houses, in the basement level, the chemical stores and includes most of the service shops as well as air-conditioning units and some building services. The first floor is devoted to library, exhibits, engineering offices, and emergency room. The second floor is entirely taken up with administrative offices. The third floor provides offices for project leaders, assembly room, glass-blowing shop, and photographic, photostat, and blueprinting area.

Chemical Laboratory Wing.--This Wing is composed of three floors of standard laboratories. The plan is based on a standard unit of three 16' x 24' rooms; the two outer rooms are standard laboratories with complete facilities; the center room is divided by temporary partitions into two office studies and a utility room, which without the partitions, is a potential laboratory. Figure 2 illustrates the arrangement. The utility rooms may be devoted to any special uses, such as constant temperature, dark room, special equipment, etc. The basement of the Chemical Laboratory Wing carries in addition to air-conditioning units and transformer vault, a receiving room, provision for future cold storage rooms, and other special rooms, such as sample storage and sample preparation. Effort was made to eliminate high-powered equipment from this wing to prevent vibration of the building. The refrigeration machinery will be mounted on island footings or with special dampening mountings. The Chemical Laboratory Wing has been arranged to allow the work requiring greatest freedom from vibration to be located on the first floor. The work demanding isolation and special aspiration of entire rooms will be located on the third floor.

Industrial Laboratory Wing.--This Wing, except the small part devoted to standard laboratories, is steel-frame construction with free standing columns along either side of the wing running up to frame a monitor overhead. These columns are connected to the outer wall structure at the second floor level with permanent steel members. The piped services are carried in a U along the inner face of the columns near the second-floor level. The electric power is supplied from a box-bus conduit circling the wing at the outer wall near the first-floor level. The entire area available for the process development is amply provided with floor drains and special plugged drain connections. Part of the ground-floor level is occupied by service shops. The first-floor deck over these shops is constructed heavily enough to serve as additional Industrial Laboratory floor space. Provision is made for additional working levels by framing with unit steel. With the exception of the Southern Regional Laboratory at New Orleans, a few standard laboratories are provided at three levels in the Industrial Laboratory Wing next to the Administrative Unit, for the purpose of housing control and research work directly associated with process development.

Service Building.--This building is separated from the laboratory proper. It provides steam for process and heating and, in three of the laboratories, chilled water for summer air-conditioning.

Solvent Storage Building.--This building is located in semi-isolation provide safe storage for bulk flammable solvents.

BUILDING SERVICES

The first, second, and third floors of both the Chemical Laboratory Wing and Administrative Unit, except the Western Regional Laboratory at Albany, California, will be air-conditioned with year-round control. The universal air-conditioning is a split system with zone units. At the Albany Laboratory, room ventilating units without cooling that draw fresh air from beneath the windows are provided in each bay.

Throughout the Chemical Laboratory Wing and the standard laboratories in the Industrial Laboratory Wing the services are carried to the various rooms by drop risers in shafts lining both sides of the corridor. These shafts are so arranged that, in addition to the vertical pipe lines, installed laterals may be run from shaft to shaft around enclosed columns or through furred enclosures over the entrances to the laboratories. This use of laterals is not recommended where risers can be used.

Both wings will be supplied with the following services:

1. Cold water at approximately 35 pounds static pressure at third floor level.
2. Compressed air at 60-100 pounds.
3. Gas--local utility.
4. Electricity--three phase--four-wire system 120 and 208 volts, 60 cycle.

Process steam will be nominally 30 pounds to the Chemical Laboratory Wing and 100 pounds to the Industrial Laboratory Wing.

Vacuum service will be supplied to the Chemical Laboratory Wing from a two-stage steam ejector pump with barometric condenser to provide a vacuum of nominally 1 inch absolute pressure.

Recirculating hot water at 150° F. will be provided for the Chemical Laboratory Wing and Administrative Unit.

Distilled water will be piped to all laboratories. The still and system are to be block-tin-lined.

Passenger and freight elevators are located at the turn of the corridor in the Administrative Unit near the Chemical Laboratory Wing. An electric dumb-waiter across the corridor from the freight elevator serves the chemical and apparatus storeroom in the basement and the library on the first floor, and is open to the corridor at all floors.

The following Shops will be located in the basement of the Administrative Unit and in the adjacent end of the Industrial Laboratory Wing: Woodworking, Plumbing, Machine, Instrument, Sheet Metal, Electrical, and Paint.

In the basement of the Chemical Laboratory Wing provision is made for two groups of freezing rooms of three bays each--one group to be used for temperatures ranging from -30° F. to 0° F., and the other group for temperatures ranging from 0° F. to 35° F.

LABORATORY ROOM SERVICES AND EQUIPMENT

The standard research laboratory is planned to provide working space for two chemists with office study adjacent. The equipment of the standard laboratory is outlined in figure 2. Because of the fact that the selection of construction materials for laboratory furnishings is determined by the degree of economy necessary as well as the nature of the work and because some selections may be matters of opinion, no particular attempt is made to identify such materials in the following descriptions.

The wall and center benches are designed with unit steel-frame construction using common-end members with all cabinet inserts interchangeable except at the dump sinks. There will be only three styles of interchangeable inserts. The bench tops and reagent shelves will be spliced at section lines. Each bench section will be 41 inches long between end-frame centers. All benches will be assembled in multiples of 41 inches. The reagent shelf will be directly above the turret and service outlets at the rear of the working surface. Each bench section will carry a full complement of services arranged in order: cold water over cup sink, compressed air, single phase A.C., vacuum, and gas. The air service located next to the cup sink provides for substitution of steam if desired. Air, gas, and vacuum services will terminate in heavy-duty plug cocks with long handles. All services will be identified by color. Only cold water will be provided at the dump sinks, with three outlets, two of which are for aspirator pumps. Reagent cabinets with sliding glass doors will be provided optionally on the reagent shelf over the wall bench.

The fume hood is designed to operate in air-conditioned laboratories with provision for sweeping the hood in closed operation without waste of room atmosphere. The working surface is of heavy soapstone without built-in steam bath. The structure will be built of acid-resistant material enclosed with vertical panels to the ceiling. In closed operation waste air will be provided under slight pressure and delivered to the hood chamber through slots in column ducts at either side of the hood sash. This air supply will be controlled automatically through the opening and closing of the hood sash. The chemist will only be responsible for the operation of the damper in the exhaust line, as it will be necessary to reduce the air flow for closed operation. Outlets for piped services will be located inside of the hood in the back board below the lower fume slot. Such services will be controlled through needle valves with replaceable plugs and seats and remote control handles on the apron of the hood. Steam and water will be located to dip or discharge directly into a cup sink. All electric services and controls will come from a flush plate in the apron of the hood. Except for service tip connections no metal will be exposed within the hood chamber. The hood light will be located in the top of the hood directed downward on the working surface. The base of the hood will carry cupboards with provision for a steam drying cabinet where specially requested. Each hood is served by an individual exhaust blower located in the penthouse.

Apparatus or chemical storage cabinets at walls will be provided in units 4 feet wide with open recessed shelf at bench level and sliding door cupboards above and below. The upper sections will have glass panel doors and the lower sections solid panel doors.

No locks will be provided on any cabinets or cupboards except for one style of combination drawer-and-cupboard insert in the benches which will be assigned, one to each chemist, and independently keyed.

The wash sink will be of stone with integral drain board and box back. A peg board of moisture-resistant material will extend the length of the sink. The height will be such that persons of average stature may reach the top pegs. The services will consist of a fixed-gooseneck mixing faucet and another gooseneck faucet for distilled water. Both faucets will allow direct filling of 5-gallon stock bottles. Special sink mats will prevent undue breakage of glassware. A safety shower with self-closing chain-operated valve will be located above the end of the sink next the doorway with the shower head directed obliquely downward.

A special cabinet will be provided for the storage and transfer of strong acids. The cabinet will be of wood or fiber with acid-resistant finish. Tellurium-lead-covered top and shelves will carry beaded edges or splash boards. The assembly will be accomplished without metal pinning.

A 4-foot balance table with stone top will be located in the office study. This table will carry drawer and draw leaf and is large enough for analytical balance in dust case and for desiccator.

The single-pedestal desks in the office study will be augmented by special bookcase sections which will furnish both bookcase and desk light without reducing the desk-top space. Provisions for other items of furnishings in the office studies are shown in figure 2.

The laboratories will be provided with small carbon dioxide fire extinguishers at the doorways to the studies and to the corridors. Larger carbon dioxide extinguishers will be located in the corridors.

Artificial illumination of the laboratories will be by semi-indirect lighting to provide 15 foot-candles on all working surfaces.

An individual electric panel located at the vestibule entry in pipe shaft wall will carry nine circuits to each laboratory. Power will be available to supply 6 kw. to every laboratory room simultaneously. The conduit will permit drawing leads to furnish 18 kw. at any one laboratory.

The partitions dividing the laboratory rooms will be of tile or metal studding and lath with plaster and painted finish. The floors will be linoleum covered. The laboratory color scheme will be largely a treatment of greens, taking care that no lead or iron pigments are used which would react to produce discolored walls and ceilings.

Along the dividing partitions below the air-conditioning grill frames, a special heavy-gauge steel molding with projected vertical slot will be mounted, locked to the partition, and plastered in. This molding will support fairly heavy temporary loads in the form of shelves or cupboards.

Doors between laboratories and laboratory studies will be without locks or latches to provide safety exits. Doors from laboratories to corridor will be without latches, although provision is made for key and turn lock. These doors open inward with push plate at corridor and pull handle within room.

All piped services from shafts to benches will be carried in laterals a few inches beneath the ceiling of the floor below and up through sleeves into the benches. No risers will exist in the laboratory rooms except those for heating steam and condensate, which will be located at the outer wall columns.

The obvious impossibility of foreseeing specific future needs in any research laboratory makes it necessary to provide as much as possible in the way of general flexibility and convenience. Although the Department of Agriculture has had much experience in the way of laboratory construction, every effort has been made to obtain further details concerning laboratory construction from others by visits to laboratories, by correspondence, or by conference. Some features within these new laboratories will be innovations which will perhaps, in turn, repay for the valuable help which has been received.

There will be a number of special items of built-in laboratory equipment and furniture, a part of which remains to be planned. Further details of this kind would be out of place in this brief description of the general design of the Regional Research Laboratories.

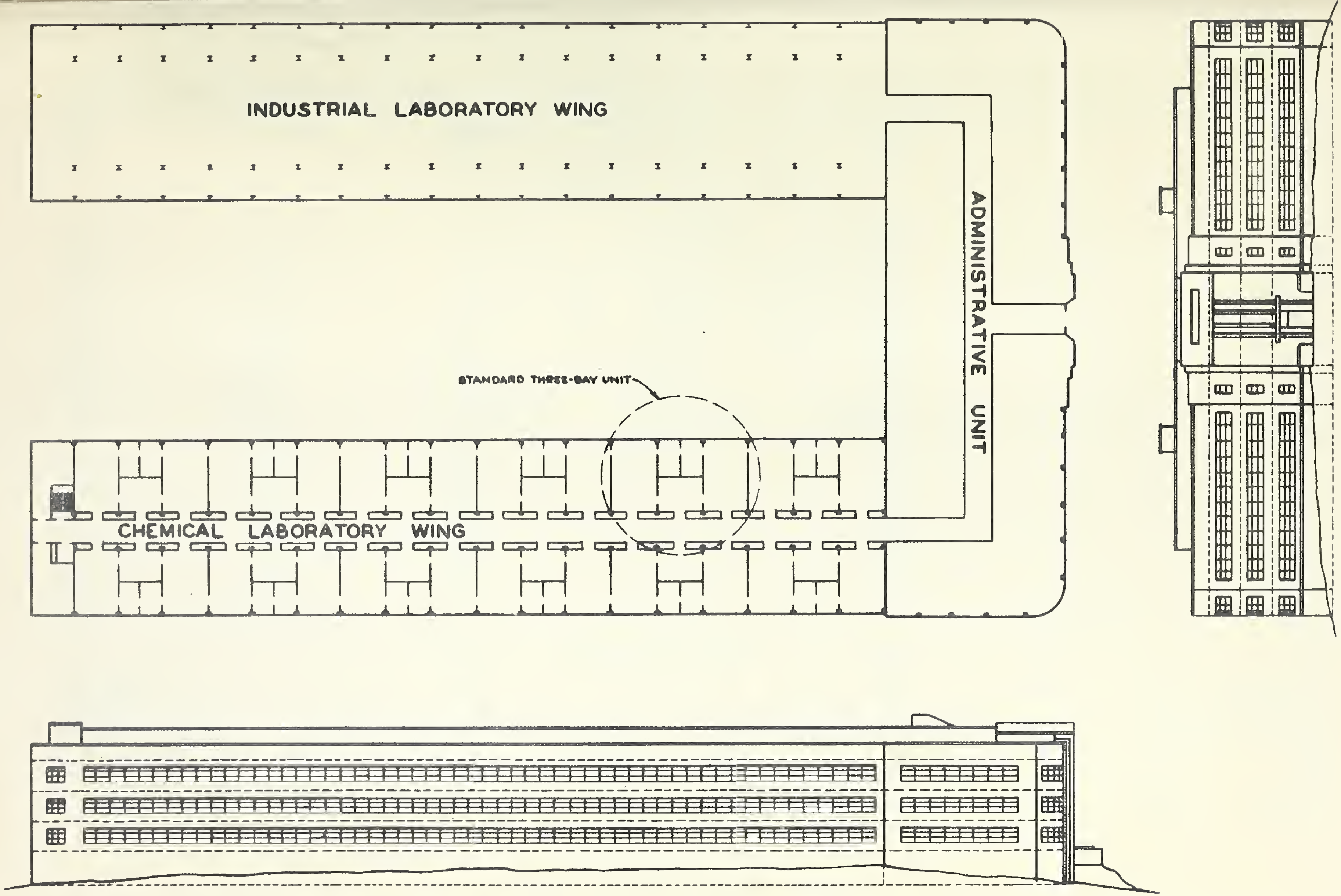

Figure 1.— Regional Research Laboratory

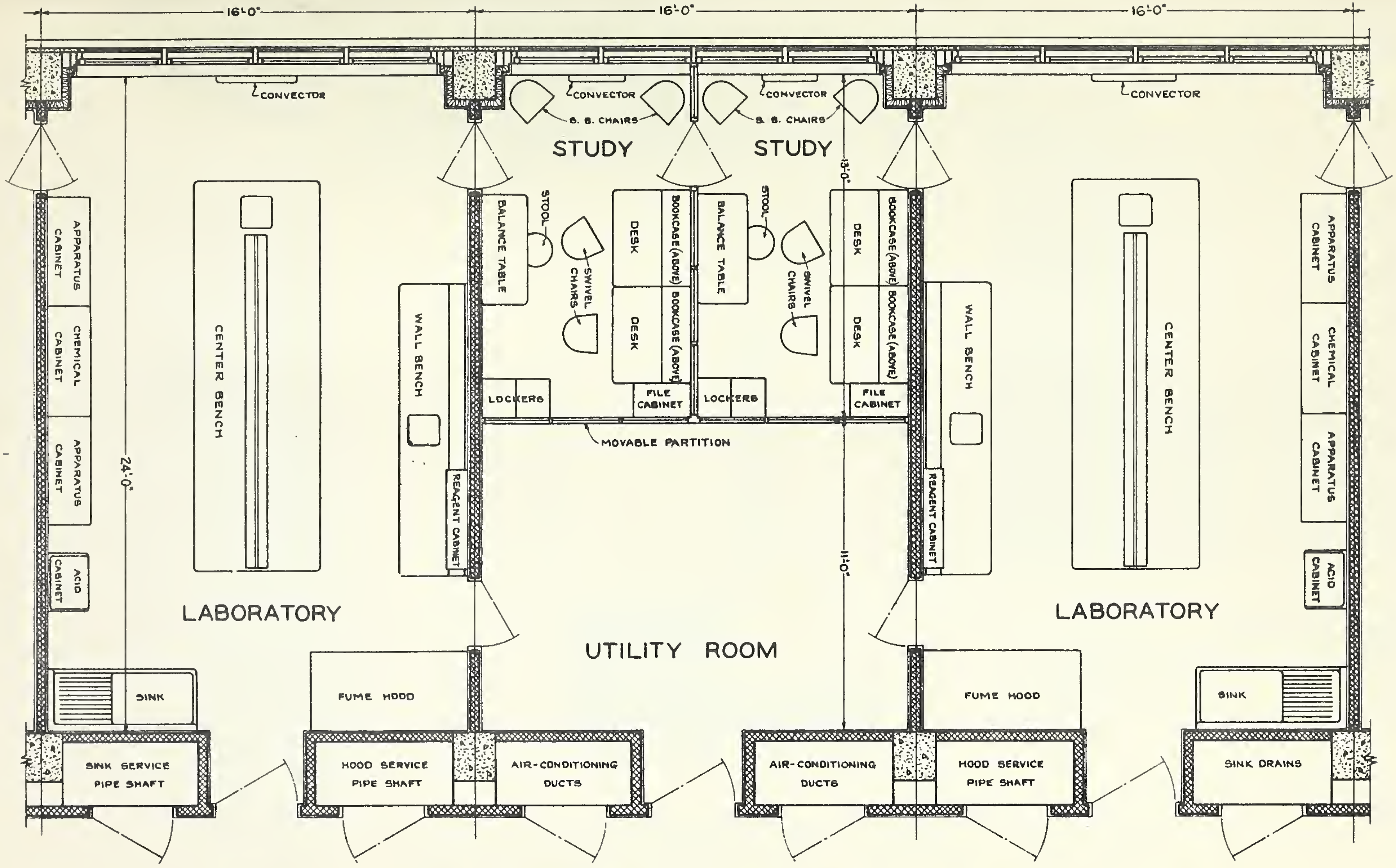

Figure 2.— Standard Three-Bay Unit